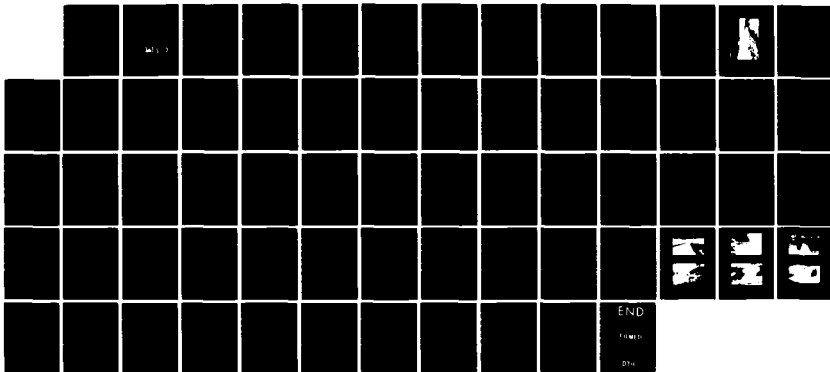


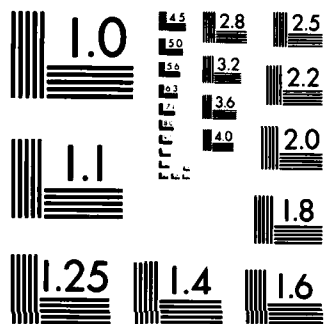
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
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CONNECTICUT RIVER BASIN
WESTFIELD, MASSACHUSETTS

WEST PARISH FILTER NO. 3 DAM
MA 00610

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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4. TITLE (and Subtitle) West Parish Filter No. 3 Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
		6. PERFORMING ORG. REPORT NUMBER
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Connecticut River Basin Westfield, Massachusetts Tributary Cook Brook		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is an earthen embankment structure 37.5 ft. high and 800 ft. long. A side-channel spillway is located at the right abutment. The dam is considered to be in fair condition. A soft, wet area near the downstream toe was noticed during the inspection. It is small in size with a hazard potential of high. The owner should make necessary repairs for the deficiencies listed in the report.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

JUN 15 1981

NEDED

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the West Parish Filter No. 3 Dam (MA-00610) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, City of Springfield, MA.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

Incl
As stated

WEST PARISH FILTER NO. 3 DAM
MA 00610

CONNECTICUT RIVER BASIN
WESTFIELD, MASS

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

IDENTIFICATION NO: MA 00610
NAME OF DAM: West Parish Filter No. 3 Dam
TOWN: Westfield
COUNTY AND STATE: Hampden, Massachusetts
STREAM: Tributary Cook Brook
DATE OF INSPECTION: November 12, 1980

West Parish Filter No. 3 Dam is an earthen embankment structure 37.5 feet high and 800 feet long. A side-channel spillway is located at the right abutment. It has a concrete overflow section which is 23.4 feet long. Outlet piping passes beneath the embankment and connects directly to the water treatment plant which serves the City of Springfield, Mass. The dam is situated on a very small (0.07 sq. mi) drainage area, and serves as offstream storage and as a sedimentation basin for water which is piped from other dams.

Based on the visual inspection, the dam is judged to be in fair condition. The following deficiencies were observed at the dam: a soft, wet area near the downstream toe; a row of evergreen trees along the downstream toe with some roots penetrating the embankment; rodent holes on the downstream slope; wheel tracks on the crest of the dam; misaligned riprap and loose rock and trees overhanging the spillway; low areas on the top of the dam; and no means of controlling flow at the upstream end of the outlet conduit.

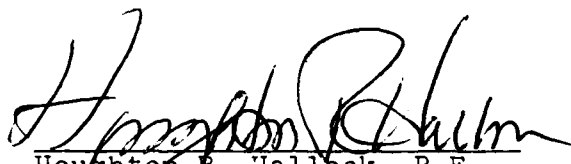
Based on the Recommended Guidelines for Safety Inspection of Dams, prepared by the Corps of Engineers, the dam is classified as "small" in size, with a "high" hazard potential. A test flood equal to the Probable Maximum Flood (PMF) was selected for the analyses performed for this report. The spillway capacity of West Parish Filter No. 3 Dam is 475 cfs with the pool level at the low point on the top of the dam. The spillway capacity is about 335 percent of the routed test flood outflow of 142 cfs. During the test flood, the freeboard would be 1.9 feet. If the entire dam were at its design level (Elevation 495.0), the freeboard during the test flood would be 3.4 feet.

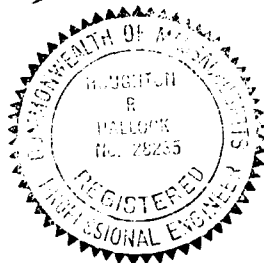
It is recommended that the Owner engage a professional engineer experienced in the design of dams to investigate the seepage at the downstream toe, investigate conditions related to the trees located at the toe of the embankment, design a means of shutting off flow at the upstream end of the outlet conduit that goes beneath the embankment, specify procedures for filling low areas on the top of the dam, design erosion protection for the crest of the dam, and specify procedures for plugging rodent holes on the downstream slope.


In addition, the Owner should make necessary repairs for the deficiencies listed above and should also implement the remedial measures described in Paragraph 7.3.

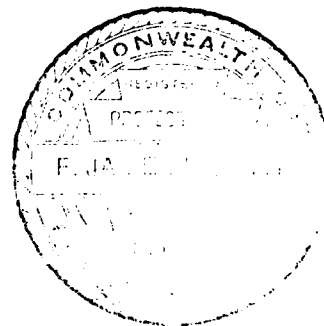
The measures outlined above, and discussed in detail in Section 7, should be implemented within one year after receipt of this Phase I Inspection Report.

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

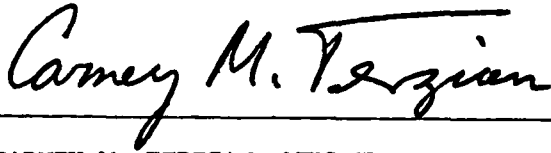

Houghton R. Hallock, P.E.



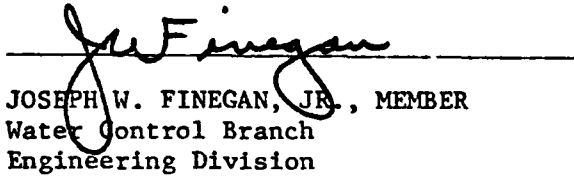

F. James Knight, P.E.
Assistant Vice President
Project Manager



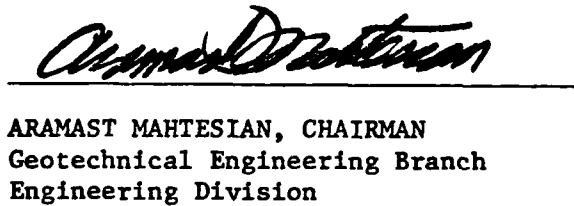
This Phase I Inspection Report on WEST PARISH FILTER NO.3 DAM (MA-00610) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.



CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

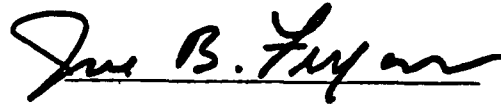


JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division



ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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APPENDIXES

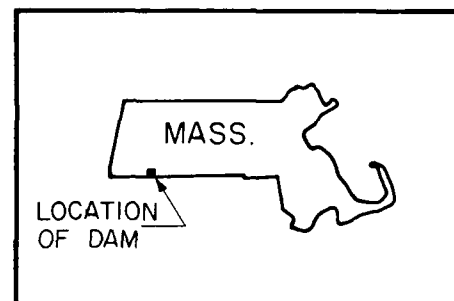
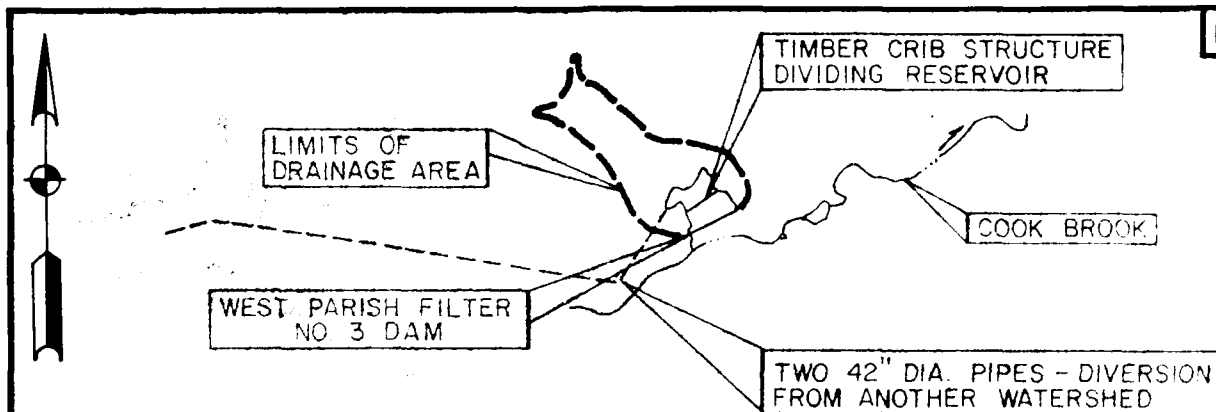
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APPENDIX B - ENGINEERING DATA
APPENDIX C - PHOTOGRAPHS
APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS
APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

West Parish Filter No. 3 Dam



Overview

FIGURE 1



VICINITY MAP

NOTES:

1. DAM SHOWN ON USGS QUADRANGLE SOUTHWICK, MASS. - CONN.
2. DAM LOCATED 4 MILES WEST OF WESTFIELD, MASS. IN WESTFIELD RIVER BASIN



GANNETT FLEMING CORDRY AND CARPENTER, INC CONSULTING ENGINEERS BOSTON, MASS		U. S. ARMY ENGINEER DIVISION NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS WEST PARISH FILTER NO. 3 DAM LOCATION MAP AND DRAINAGE AREA			
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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
WEST PARISH FILTER NO. 3 DAM

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. Public Law 92-367, dated August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility for supervising the inspection of dams within the New England Region. Gannett Fleming Cordary and Carpenter, Inc., has been retained by the New England Division to inspect and report on selected dams in the States of Vermont and Massachusetts. Contract No. DACW33-81-C-0013 dated November 5, 1980, has been assigned by the Corps of Engineers for this work.

b. Purpose. The purpose of the inspection and evaluation of non-Federal dams is to accomplish the following:

(1) Identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the states to quickly initiate effective dam safety programs for non-Federal dams.

(3) Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project.

a. Location. The dam is located on an unnamed tributary to Cook Brook, which is in the Westfield River Basin, and lies entirely within the corporate boundary of Westfield, Massachusetts. The dam is shown on USGS Quadrangle, Southwick, MASS-CONN, at latitude N 42° 07' 05" and longitude W 72° 50' 03". The location is shown on Figure 1 on page v.

b. Description of Dam and Appurtenances. West Parish Filter No. 3 Dam is an earthen embankment structure. The dam is 37.5 feet high and 800 feet long. Details of the dam are shown on Exhibit B-1 in Appendix B, on the Overview Photograph, and on the photographs in Appendix C. The dam has a riprap protected

upstream slope (Photo No. 1) and a grass covered downstream slope (Photo No. 2). Both slopes are 2 horizontal to 1 vertical. It has a cutoff trench with a concrete cut-off wall from natural ground surface to bedrock. A "puddle core" is in the center of the embankment, and gravelly random fill sections form both the upstream and downstream portions.

There is a side-channel spillway at the right abutment of the dam (Photo No. 3). An earthen approach channel leads from the reservoir to a concrete weir. The approach channel is about 25 feet wide and 100 feet long, and its centerline is parallel with the axis of the dam. The concrete weir is 23.4 feet long, and its crest is at Elevation 490.0. The topwidth of the weir is 3.0 feet, and it is perpendicular to the axis of the dam. The spillway discharge channel is parallel with the top of the concrete weir. The discharge channel is about 10 feet wide, steep, and lined with stone masonry. A concrete bridge, with an opening 10.5 feet wide and 7.0 feet high, crossed the channel at the axis of the dam (Photo No. 4).

A 24-inch diameter cast-iron pipe conduit passes beneath the embankment near the highest section of the dam. There is no control valve on the upstream end. The conduit is valved on its downstream end and connects directly with the water treatment plant located just below the dam.

The reservoir is separated into two sections by a rock filled timber crib structure which approximately parallels the alignment at the dam at about the reservoirs mid-point (Photo No. 5). The timber crib structure is about 10 feet wide and approximately 20 feet high. Except at the top of the structure, the faces are vertical. At the top, the structure tapers from its 10-foot width to a top width of 1.5 feet. A large, hinged flap valve at the bottom of the crib allows water to pass from one section to the other. The apparent purpose of this structure is to aide in settling of suspended solids from the water.

c. Size Classification. Size classification is determined in accordance with Corps of Engineer guidelines and is determined by either height or storage, whichever gives the larger size category. West Parish Filter No. 3 Dam has a maximum height of 37.5 feet and a maximum storage capacity of 133 acre-feet. Both the height and the storage capacity are within the range specified by the guidelines for a "small" size dam.

d. Hazard Classification. The dam was constructed across a draw along the left side of the valley of Cook Brook. The axis of the dam is approximately parallel to Cook Brook, with the distance from the dam to Cook Brook being only about 150 feet. At the location of the dam, there is a wide section in the valley. Steep, narrow valley sections are located both upstream and downstream from this wide area. A water filtration plant is located just downstream from the toe of the dam. The plant consists of seven buildings, sand filters, and other related

water treatment facilities, water works offices and maintenance shops (Photo No. 6). The buildings are located between 60 feet and 600 feet downstream from the toe of the dam. It is estimated that 35 persons work at the plant. Failure of the dam would cause significant property damage and probable loss of more than a few lives. Accordingly, the dam has been placed in the "high" hazard category.

e. Ownership. The dam is presently owned by the City of Springfield, Mass. Mr. Broderick, Director of Public Works, (413-787-6072) granted permission to enter the property and inspect the dam.

f. Operator. The dam is operated by personnel from the City under direction of the Director of Public Works.

g. Purpose of Dam. West Parish Filter No. 3 Dam serves as a water storage basin and sedimentation facility. It is part of the Springfield city water system.

h. Design and Construction History. The dam was constructed in 1910 as part of a water system for the City of Springfield. It has been maintained by the City since that time. Limited data are available in the Department of Public Works.

i. Normal Operational Procedures. There are no formal operating procedures. Pool level is controlled by water diverted into the reservoir from other dams, and by the amount of release through the water treatment plant.

1.3 Pertinent Data.

a. Drainage Area. The drainage area for the dam is 0.07 square mile. The terrain is mountainous and is entirely wooded. Two 42-inch diameter conduits provide additional inflow diverted from another watershed. The conduits discharge into the northwest end of the reservoir. Valves on the upstream ends of the conduits allow regulation or shutting off the additional inflow.

b. Discharge at the Dam. The only outlet facilities for the dam consist of the water supply line leading to the treatment plant. Consumptive use of water from the reservoir is sufficient to maintain the normal pool level at or below the spillway crest level. Excess inflow is discharged over the spillway at the right end of the dam. Flows have not been recorded at the site and, therefore, the maximum flood discharge is unknown. Hydraulic calculations indicate the spillway can discharge 475 cfs when the water level is at the low point on the top of the dam. During the test flood (PMF), the peak discharge would be 142 cfs with the pool level 1.6 feet above the spillway crest.

c. Elevation (feet above NGVD).

- (1) Streambed at toe of dam - 456.0
- (2) Tailwater with pool at top of dam - not applicable.
- (3) Normal pool - 490.0
- (4) Full flood control pool - not applicable.
- (5) Spillway crest - 490.0
- (6) Design surcharge (original design) - unknown.
- (7) Top of dam (low point) - 493.5
- (8) Top of dam (design level) - 495.0
- (9) Test flood surcharge - 491.6
- (10) Top of timber crib (reservoir dividing structure) - 490

d. Reservoir (length in feet).

- (1) Normal pool - 440
- (2) Flood control pool - not applicable.
- (3) Spillway crest pool - 440
- (4) Top of dam - 450
- (5) Test flood pool - 450

e. Storage (acre-feet).

- (1) Normal pool - 99.7
- (2) Flood control pool - not applicable.
- (3) Spillway crest pool - 99.7
- (4) Top of dam (low point) - 133.1
- (5) Top of dam (design level) - 149.0
- (6) Test flood pool - 114.0

f. Reservoir Surface (acres).

- (1) Normal pool - 8.8
- (2) Flood control pool - not applicable.
- (3) Spillway crest - 8.8
- (4) Top of dam (low point) - 10.3
- (5) Top of dam (design level) - 10.9
- (6) Test flood pool - 9.1

g. Dam.

- (1) Type - earthfill.
- (2) Length - 800 feet.
- (3) Height - 37.5 feet.
- (4) Top width - 16 feet.
- (5) Side slopes - 1V on 2H.
- (6) Zoning - clay core; gravel shell.
- (7) Impervious core - puddled clay.
- (8) Cutoff - 3-foot concrete wall and puddled clay.
- (9) Grout curtain - unknown.

h. Diversion and Regulating Tunnel. Not applicable.

i. Spillway.

- (1) Type - side channel with concrete weir.
- (2) Length of weir - 23.4 feet.
- (3) Crest elevation - 490.0.
- (4) Gates - none.
- (5) Upstream channel - reservoir and short approach channel.
- (6) Downstream channel - rock-lined, excavated channel.

j. Regulating Outlets.

- (1) Invert - not applicable.
- (2) Size - 24-inch diameter.
- (3) Description - cast-iron pipe leading from reservoir to water treatment plant.
- (4) Control mechanism - valve on downstream end at treatment plant.

SECTION 2
ENGINEERING DATA

2.1 Design Data. Limited engineering data, design drawings and records are in the possession at the Springfield Department of Public Works.

2.2 Construction Data. No construction records are known to exist.

2.3 Operation Data. No operating records are available.

2.4 Evaluation of Data.

a. Availability. The engineering data available for this dam is limited.

b. Adequacy. Data are inadequate to fully evaluate the structure in every detail.

c. Validity. Available data appear to be valid.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The Phase I Inspection of West Parish Filter No. 3 Dam was performed on November 12, 1980. A copy of the inspection checklist is included in Appendix A. Photographs taken during the inspection are included in Appendix C. A summary of the results of this visual inspection is shown on Exhibit B-2 in Appendix B.

b. Dam. The dam consists of an earthen embankment with upstream and downstream slopes of 2H:1V.

The crest of the embankment consists of sand and gravel. A set of wheel tracks on the crest are completely bare of vegetation (Photo No. 1).

The upstream slope is covered with riprap, about 12 to 18 inches in size, from an elevation about 2 feet below the crest to some elevation below the water level in the reservoir at the time of the inspection. There is a slight irregularity in the riprap just below the high water mark, which is evidenced by dark staining of the riprap (Photo No. 1).

The downstream slope has a sparse cover of grass and weeds which have been mowed (Photo No. 2). There are also a few stubs of small brush (up to about one inch in diameter) which appear to have been cut within a year or so before the inspection. There is one area, about 10 feet by 25 feet in size, on the downstream slope near the toe which is wet and soft, but with no visible discharge of seepage water (Photo No. 2). This wet area had also been noted in the report of an earlier inspection dated 1976. One animal burrow was observed on the downstream slope.

Immediately adjacent to the downstream toe of the right half of the dam, there are two rows of tall spruce trees (Photo No. 2). The roots of several of these trees, adjacent to the embankment and in the vicinity of the soft, wet area noted above, have been cut.

The contacts between the downstream slope and the abutments appear to be in good condition, and both abutments appear to consist of bedrock.

c. Appurtenant Structures. There is a side-channel spillway at the right abutment of the dam (Photo Nos. 3 and 4). The spillway consists of an earthen approach channel, a 23.4-foot long concrete weir, and a discharge channel. A concrete bridge crosses the discharge channel at the axis of the dam (Photo No. 4). Both the spillway approach channel and the concrete weir are in good condition. The discharge channel is in fair condition. Some rocks in the stone masonry lining are loose and might be washed away under large flows. The bridge across the spillway discharge channel is in satisfactory condition.

The 24-inch diameter outlet conduit that leads from the reservoir to the water treatment plant could not be inspected. Reportedly, there is no valve or other means of shutting off flow at the intake end of the conduit. There is a valve on the downstream end of the conduit in the treatment plant.

d. Reservoir Area. The watershed is relatively steep and is entirely wooded. Two 42-inch diameter conduits provide additional inflow diverted from another watershed. Valves on the conduits permit regulation or shutting off the diverted water. Within the reservoir itself, there is a timber crib structure that divides the reservoir into two sections (Photo No. 5). The structure is about 10 feet wide and approximately 20 feet high. At the top of the structure, it tapers from its 10-foot width to a top width of 1.5 feet. The purpose of the structure is to promote settlement of particles in an area distant from the water supply intake. The top of the structure is approximately at the level of the spillway crest. An orifice with a wooden flap gate located at the bottom of the structure allows equalization of pool levels during periods of low to moderate inflow. If the orifice capacity were to be exceeded, the structure would act as a weir with excess inflow discharging over its top. Visible portions of the structure were in fair condition.

e. Downstream Channel. West Parish Filter No. 3 Dam was constructed across a draw along the north side of the valley of Cook Brook. The axis of the dam is approximately parallel to Cook Brook, with the distance from the dam to Cook Brook being only about 150 feet. At the location of the dam, the valley is about 1000 feet wide and it is relatively flat. A water filtration plant is located in this part of the valley just downstream from the dam. The filtration plant is the primary potential damage center. The plant consists of 7 buildings, sand filters, and other related treatment facilities, water works offices and maintenance shops. It is estimated that approximately 35 persons work at the site. The buildings are located from 60 feet to 600 feet from the toe of the dam (Photo No. 6). The downstream area is shown on Exhibit D-1 in Appendix D.

3.2 Evaluation.

On the basis of the visual inspection the dam is judged to be in fair condition.

A soft, wet area on the downstream slope near the toe is evidence that the line of seepage through the dam exits on the slope, a condition which could lead to a piping failure of the embankment if the embankment soils are susceptible to piping.

Trees growing along the downstream toe of the dam could be a cause of seepage and piping problems if one of the trees falls over and pulls out its roots, or if a tree dies or is cut and its roots rot. The roots that have been sawed off from the embankment side of several trees will now start to rot and may become channels of seepage and piping.

The lack of vegetation in the set of wheel tracks on the crest of the dam makes the crest susceptible to erosion in the event that the dam were to be overtopped.

A rodent hole on the downstream slope could lead to seepage and piping problems if it is not properly plugged.

A slight irregularity in the riprap on the upstream slope in the normal range of reservoir indicates that some movement of the riprap has occurred, probably due to wave action and freezing action. However, the riprap appears to provide adequate erosion protection and no repairs appear to be needed at this time.

Some loose rock and trees overhanging the discharge channel downstream of the spillway could result in erosion or obstruction of the discharge channel during periods of discharge over the spillway.

There is no valve or other means of shutting off flow at the intake end of the 24-inch diameter conduit that is located beneath the embankment. If the conduit were to develop a leak, it could not be stopped and piping failure of the dam could ensue.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures.

a. General. Personnel from the City of Springfield, Department of Public Works, staff the water treatment plant located just downstream from the dam on a full-time basis. The downstream slope of the dam is visible from the plant. The dam is observed on a daily basis.

b. Description of any Warning System in Effect. No formal warning system is in effect.

4.2 Maintenance Procedures.

a. General. Department of Public Works personnel perform regular maintenance on the facility. No detailed history of modifications or repairs was made available. Vegetation is kept mowed and the dam appears to be well-maintained. Tree roots which enter the toe of the dam, have been cut. This condition may cause future problems as the severed roots decay and form possible water passages.

b. Operating Facilities. The valves and piping which were visible appeared to be well maintained.

4.3 Evaluation. Maintenance of the dam appears to be adequate. The advice of a professional engineer experienced in the design, construction and maintenance of dams could be of significant value to direct actions along sound courses. The absence of a formal inspection and emergency warning plan is unsatisfactory and should be corrected. These programs should be implemented by the Owner as recommended in Section 7.3.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General. West Parish Filter No. 3 Dam has a drainage area of 0.07 square mile. The watershed area is mountainous, wooded, and undeveloped. There are two 42-inch diameter conduits that provide additional inflow diverted from another watershed. Since the conduit discharges can be eliminated by closing valves, diversion inflow was not considered in the analysis. There are no other impoundments upstream from West Parish Filter No. 3 Dam.

The dam is 37.5 feet high and 800 feet long. It is a zoned, earthen embankment. There is a side channel spillway at the right abutment of the dam. The weir length is 23.4 feet, and the crest is at Elevation 490.0. There was not sufficient data available to determine if the spillway structure is designed to prevent crest submergence throughout the entire range of pool levels, but for the purposes of this report, it is assumed that the weir acts as the only flow control. Although there is an approach channel to the spillway, it is relatively short and approach losses are considered to be minor. Maximum spillway capacity is controlled by a low point on the top of the dam near the spillway. The low point is at Elevation 493.5. Most of the top of the dam is at the design level, Elevation 495.0.

The only outlet works facilities at the dam consist of the water supply conduit leading from the reservoir to the treatment plant. Consumptive use of water from the reservoir is sufficient to maintain the normal pool level at or below the spillway crest level. Discharge through the supply line was not considered in the analysis.

The timber crib structure in the reservoir was not judged to significantly affect the hydraulics. During a flood, small pool level differentials would exist, but there would be negligible effect. If the dam were to fail, there would be a very brief period when a significant pool level differential might exist. However, the timber structure has a thin cross-section, and failure of it would quickly ensue. As a result, failure conditions would only be modified slightly. The hydrologic and hydraulic computations performed for this report are included in Appendix D.

5.2 Design Data. There are no hydrologic or hydraulic design data available for the dam.

5.3 Experience Data. There are no records of the maximum discharge at the site.

5.4 Test Flood Analysis. West Parish Filter No. 3 Dam is in the "small" size category and in the "high" hazard category. In accordance with Corps of Engineers' guidelines, a spillway design flood ranging between the one-half Probable Maximum Flood (PMF) and the full PMF should be used to evaluate the spillway. In the following analysis, the PMF was used as the test flood. The test flood (PMF) inflow of 179 cfs is based on a watershed area of 0.07 square mile in mountainous terrain. The test flood was routed through the reservoir. The rating curve used for the spillway was based on the assumption that the weir is the only flow control for the side channel spillway. The effects of the timber crib structure in the reservoir were judged to be minor and were not included in the analysis. The routed test flood outflow was determined in accordance with Corps of Engineer Guidance for Estimating Effect of Surge Storage on Maximum Probable Discharges. The routing was started with the pool level at the crest of the spillway. The routed test flood outflow was determined to be 142 cfs. The maximum capacity of the spillway with the pool level at the low point on the top of the dam is about 475 cfs, which is approximately 335 percent of the routed test flood outflow. The pool level resulting from the test flood would be at Elevation 491.6, which is 1.9 feet lower than the low point on the top of the dam. If the entire top of the dam were at the design level (Elevation 495.0), the freeboard during the test flood would be 3.4 feet.

5.5 Dam Failure Analysis. The impact of failure of the dam was assessed. The breach discharge was estimated with the water surface at the test flood level and a breach width of 100 feet. The maximum breach discharge was determined to be 35,713 cfs. Because of the proximity of the primary damage center to the dam, there would not be any significant routing effect. For the structures close to the dam, it is likely that water levels would exceed the computed normal depth for the breach discharge. It is estimated that depths at the damage center would easily exceed 4 feet with velocities greatly in excess of 13 feet per second. For this reason, the dam has been placed in the "high" hazard category. The probable flood impact area is shown on Exhibit D-1 in Appendix D.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations.

The following conditions observed during the visual inspection are indicative of problems that could adversely affect the long-term stability of the dam:

a. A soft, wet area on the downstream slope near the toe is evidence that the line of seepage through the dam exits on the slope, a condition which could lead to a piping failure of the embankment if the embankment soils are susceptible to piping.

b. Trees growing along the downstream toe of the dam could be a cause of seepage and piping problems if one of the trees falls over and pulls out its roots, or if a tree dies or is cut and its roots rot. The roots that have been sawed off along the embankment side of several trees will now start to rot and may become channels of seepage and piping.

c. The lack of vegetation in the set of wheel tracks on the crest of the dam makes the crest susceptible to erosion in the event that the dam were to be overtopped.

d. A rodent hole on the downstream slope could lead to seepage and piping problems if it is not properly plugged.

e. There is no valve or other means of shutting off flow of the intake end of the 24-inch diameter conduit that is located beneath the embankment. If the conduit were to develop a leak, it could not be stopped and piping failure of the dam could ensue.

f. Some loose rocks in the stone masonry lining of the spillway discharge channel could result in erosion during periods of spillway flow.

A slight irregularity in the riprap on the upstream slope in the normal range of reservoir levels indicates that some movement of the riprap has occurred, probably due to wave action and freezing action. However, the riprap appears to provide adequate erosion protection and no repairs appear to be needed at this time.

6.2 Design and Construction Data. Record drawings show that the dam has a "puddled clay core" about 40 feet wide at the bottom and 15 feet wide at the top, the top elevation being 485 compared to the elevation of the crest of the dam at 495. The upstream and downstream shell material up to the elevation of the top of the core is identified as "gravel from filter excavation" and the material from the top of the core to the crest of the dam is identified as "from borrow pit No. 2."

Over a 120-foot long reach at the highest portions of the dam, there is a concrete cut-off wall 6 feet wide, extending about 20 feet into the foundation (drawings not clear as to whether the foundation is rock or soil) and about 4 feet above the foundation into the embankment. Over the remaining portions of the dam, the cutoff wall is 3 feet wide.

It is not possible to determine on the basis of the visual inspection alone whether or not the dam was actually constructed as shown on the record plans.

6.3 Post-Construction Changes. No post-construction changes were reported or observed.

6.4 Seismic Stability.

This dam is located in the border zone between Seismic Zones 1 and 2 and, in accordance with the Phase I guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment.

a. Condition. Based on the results of the visual inspection, West Parish Filter No. 3 Dam is judged to be in fair condition. The following conditions are indicative of potential long-term problems:

(1) A soft, wet area on the downstream slope near the toe is evidence that the line of seepage through the dam exits on the slope, a condition which could lead to a piping failure of the embankment if the embankment soils are susceptible to piping.

(2) Trees growing along the downstream toe of the dam could be a cause of seepage and piping problems if one of the trees falls over and pulls out its roots, or if a tree dies or is cut and its roots rot. The roots which have been sawed off along the embankment side of several trees will now start to rot and may become channels of seepage and piping.

(3) The lack of vegetation in the set of wheel tracks on the crest of the dam makes the crest susceptible to erosion in the event that the dam were to be overtopped.

(4) A rodent hole on the downstream slope could lead to seepage and piping problems if it is not properly plugged.

(5) Some loose rock and trees overhanging the discharge channel downstream of the spillway could result in erosion or obstruction of the discharge channel during periods of discharge over the spillway.

(6) There is no valve or other means of shutting off flow at the intake end of the 24-inch diameter conduit that is located beneath the embankment. If the conduit were to develop a leak, it could not be stopped and piping failure of the dam could ensue.

Hydraulic analyses indicate that the spillway can discharge 475 cfs with the pool level at the low point on the top of the dam. The spillway capacity is about 335 percent of the

routed test flood outflow of 142 cfs. During the test flood, the freeboard would be 1.9 feet. If the entire dam were at its design level (Elevation 495.0), the freeboard during the test flood would be 3.4 feet. If the dam were to fail, there would be severe property damage and probable loss of more than a few lives.

b. Adequacy of Information. The available information is such that the assessment of this dam must be based primarily on the results of the visual inspection.

c. Urgency. The Owner should implement the recommendations and remedial measures of Paragraphs 7.2 and 7.3 within one year after receipt of this Phase I report.

7.2 Recommendations. The following investigations should be carried out and necessary repairs performed under the direction of a registered engineer qualified in the design and construction of dams:

(1) Investigate the cause of the soft, wet area on the downstream slope of the dam near the toe, design remedial measures, and oversee construction of the remedial measures.

(2) Specify procedures for and oversee removal of trees and their root systems, including the roots that have already been sawed off from standing trees along the downstream toe of the dam.

(3) Design a means of shutting off flow at the upstream end of the outlet conduit that goes beneath the embankment.

(4) Design erosion protection for the crest of the dam and oversee construction of the erosion protection.

(5) Specify and oversee procedures for plugging the rodent holes on the downstream slope.

(6) Specify procedures and oversee operations for filling low areas on the top of the dam to the design level (Elevation 495.0).

7.3 Remedial Measures.

a. Operating and Maintenance Procedures. The Owner should:

(1) Visually inspect the dam and appurtenant structures once a month.

(2) Engage a registered engineer qualified in the design and construction of dams to make a comprehensive technical inspection of the dam once every year.

(3) Establish a surveillance program for use during and immediately after heavy rainfall and also a downstream warning program to follow in case of emergency.

(4) Repair any loose stone masonry in the spillway discharge channel and remove overhanging portions of trees along the channel.

7.4 Alternatives. There are no practical alternatives to the above recommendations.

APPENDIX A
INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

TIME pm

WEATHER clear, cool

W.S. ELEV. 485 U.S.N. A D.W.S.

PARTY:

- | | |
|-----------------------------------|-----------|
| 1. <u>F. James Knight (GFCC)</u> | 6. _____ |
| 2. <u>Ronald Hirschfeld (GEI)</u> | 7. _____ |
| 3. <u>Dennis Mehue (BAI)</u> | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Hydrology/Physical</u>	<u>Knight</u>	
2. <u>Geotechnical</u>	<u>Hirschfeld</u>	
3. <u>Dimensional</u>	<u>Mehue</u>	
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE Dam Embankment NAME Knight

DISCIPLINE _____ NAME Hirschfeld

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	Design Elev. 494, low 493.5.
Current Pool Elevation	+ - 485
Maximum Impoundment to Date	Unknown.
Surface Cracks	None observed.
Pavement Condition	Not paved.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Good - some minor low areas.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	Not applicable.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Minor misalignment of riprap at normal pool elevation.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	Soft, wet area at bottom of slope above trees.
Piping or Boils	None observed.
Foundation Drainage Features	None.
Toe Drains	None.
Instrumentation System	None.
Vegetation	Grass on crest and downstream slope. Some small brush recently cut.

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
<u>DIKE EMBANKMENT</u>	
Crest Elevation	No dike.
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER</u>	
a. Concrete and Structural	No control tower.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <p>Slope Conditions</p> <p>Bottom Conditions</p> <p>Rock Slides or Falls</p> <p>Log Boom</p> <p>Debris</p> <p>Condition of Concrete Lining</p> <p>Drains or Weep Holes</p> <p>b. Intake Structure</p> <p>Condition of Concrete</p> <p>Stop Logs and Slots</p>	<p>Not visible beneath reservoir surface.</p>

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u> General Condition of Concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths	Not visible beneath reservoir surface.

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain Holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p>Outlet piping connects directly to filtration plant.</p>

PERIODIC INSPECTION CHECKLIST

PROJECT West Parish Filter No. 3 Dam DATE Nov. 12, 1980

PROJECT FEATURE Spillway NAME Knight

DISCIPLINE _____ NAME Hirschfeld

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Sediment covered rock.
b. Weir and Training Walls	
General Condition of Concrete	Good.
Rust or Staining	None observed.
Spalling	None observed.
Any Visible Reinforcing	None observed.
Any Seepage or Efflorescence	None observed.
Drain Holes	None.
c. Discharge Channel	
General Condition	Fair.
Loose Rock Overhanging Channel	Some loose overhanging rock.
Trees Overhanging Channel	Trees overhanging.
Floor of Channel	Bedrock and boulders.
Other Obstructions	None.
Other Comments	

APPENDIX B
ENGINEERING DATA

INSPECTION REPORT DAMS AND RESERVOIRS

1. LOCATION:

City/Town Westfield County Hampden Dam No. 2-7-828-10

Name of Dam West Parish Filter Dam #5 (Upper)

Mass. Reet.

Topo Sheet No. 9D Coordinates: N 410,500 E 238,000

Inspected by: R. C. Sells, P.E. On Feb. 20, 1974 Date Mar. 26, 1974 Last Inspection 1970

2. OWNER/S: As of Feb. 20, 1974

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. _____, Per. Contact X

Attn: Mr. Broderick, Supervising Engineer

1. City of Springfield Board of Water Commissioners, City Hall, Court St., Springfield,
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____ Mass.

2. _____
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

3. _____
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Herb Root, Supt. West Parish Filters, Granville Rd., Westfield, Mass.

Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

4. DATA:

No. of Pictures Taken None Sketches See description of Dam
Plans, Where In Water Dept. offices in Springfield City Hall and at West
Parish filter beds.

5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor _____ 3. Severe _____
2. Moderate X _____ 4. Disastrous _____

Comments: Complete and sudden failure could remove filter beds and other instal-
lations of water level.

*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

At west end of dam 24' w-5' concrete weir wall-5' drop
No. 1 Location and Type: to side chute spillway channel to Cook Brook 35'-40' drop.

Controls None, TYPE: Overflow controlled by concrete weir.

Automatic____. Manual____. Operative Yes____, No____.

Comments: Elevation top weir 490', water seldom flows over overflow.

No. 2 Location and Type: 42" pipe from intake structure to Filters Nos. 1 to 10.

Controls Yes, Type: Various valves, etc. to direct water through filters.

Automatic____. Manual X. Operative Yes X, No____.

Comments: Also stoplogs on inlet structure.

No. 3 Location and Type: 42" pipe from intake structure to Filters Nos. 11 to 14.

Controls Yes, Type:_____.

Automatic____. Manual____. Operative Yes X, No____.

Comments: NOTE: This pipe can also act as an inlet to pond.

Drawdown present Yes____, No____. Operative Yes X, No____.

Comments: See Nos. 2 and 3 above.

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 23' at elev. 490'

Material: Turf____. Brush & Trees____. Rock fill X. Masonry____. Wood____.

Other stone paving.

Condition: 1. Good X. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments: Please show 1' of rock fill stone paving on slope. Embankment is supposed to have clay rubble core with concrete cutoff wall to bedrock.

8. DAM DOWNSTREAM FACE: Slope 2:1.

Material: Turf X. Brush & Trees____. Rock Fill____. Masonry____. Wood____.

Other_____.

Condition: 1. Good X. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments: See also gravel roadway on it.

9. EMERGENCY SPILLWAY: Available Yes. Needed .

Height Above Normal Water Zero Ft. See note below

Width 24 Ft. Height 5 Ft. Material Concrete wall.

Condition: 1. Good X. 3. Major Repairs .

2. Minor Repairs . 4. Urgent Repairs .

Comments: See No. 6 Sub. 1 above. NOTE: Water level in this pond is controlled
by amount of discharge from Intake Reservoir and by amount of water fed
to filters.

10. WATER LEVEL AT TIME OF INSPECTION: 7+ Ft. Above . Below X.

Top Dam X F.L. Principal Spillway .

Other .

Normal Freeboard 5'-12" Ft. - Varies with amount of use of water.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam None noted.

Cracked or Damaged Masonry None.

Evidence of Seepage None found.

Evidence of Piping None found.

Leaks None found.

Erosion None found.

Trash and/or Debris Impeding Flow No.

Clogged or Blocked Spillway No.

Other Work in progress on new filters and water treatment facilities below may
change configuration of outlet controls.



The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

City of Springfield
Board of Water Commissioners
City Hall
Court Street
Springfield, Ma.

100 Nashua Street, Boston 02111

ATTN: Mr. F. Brudetick, Supervising Engineer

March 7, 1977

Re: Inspection Dam #2-7-329-10

~~West Parish Filtered Dam #3 at Upper~~
Westfield, Ma.

Dear Sir:

On May 24, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be the City of Springfield. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. Dam Basin Seepage Face: Area 25' - 30' long and 10' + wide at toe of downstream slope. Area located where large spruce trees grow at toe of slope.
2. Upstream Side: Stone masonry sidewalk on southernly side of intake channel to buttress wall is failing. Many misplaced stones from wall lay at base of wall. Top of bank has 1 or 2 six to eight inch trees growing. One large hemlock tree has been recently cut. Root system could be cause of wall failure.
3. Trash: Court poor on seepage area.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

John J. Hannon, P.E.
Chief Engineer

Attest:
Mr. Robert W. M., Capt.
Charles J. Ryan
Public Works
1977



INSPECTION REPORT - DAMS AND RESERVOIRS

LOCATION:

City/Town Westfield County Hamden Dam No. 2-7-329-10

Name of Dam West Parish Filter Dam #3 (Upper)

Mass. Rect.

Topo Sheet No. 9D Coordinates: N 410,300, E 238,000

Inspected by: Harold T. Shumway, On May 24, 1976 Date 2-20-74
Last Inspection 3-25-74

OWNER/S: As of May 24, 1976

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. X, Per. Contact X

1. City of Springfield, Board of Water Commissioners
Attn: Mr. F. Brodrick, Supervising Eng., City Hall, Court St., Springfield, Mass.
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

2. _____
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

3. _____
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.

Mr. Robert Risgal, Supt., West Parish Filters, Granville Road, Westfield, Mass.
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

DATA:

No. of Pictures Taken _____ Sketches See description of Dam.
Plans, Where Water Dept. files in Springfield City Hall and at West Parish
Filter Beds.

DEGREE OF HAZARD: (if dam should fail completely)*

- | | |
|----------------------|---------------------|
| 1. Minor _____ | 3. Severe _____ |
| 2. Moderate <u>X</u> | 4. Disastrous _____ |

Comments: Approximately 57 million gallons impoundment-could damage filter beds and
other installations of water dept.

*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

At West end of dam—24'W. X 5'H. concrete weir wall—5' drop to
No. 1 Location and Type: side chute spillway channel to Cook Brook—35' to 40' total drop.

Controls None, TYPE: _____

Automatic _____. Manual _____. Operative Yes _____, No _____.

Elev. of top of weir 490'—Pockets of standing water noted in channel
Comments: bad at toe of weir—could be minor seepage through ledge fissures.

concrete intake structure with 42"
No. 2 Location and Type: Upstream toe of slope—dia. pipe to filters Nos. 1 to 10.

Controls Yes, Type: Several gate valves etc., to direct water through filters.
Also stop logs inlet structure.

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Structure and controls in good condition per water dept. personnel.

No. 3 Location and Type: 42" dia. pipe to filters Nos. 11 to 14.

Controls Yes, Type: Gate valves

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Note: This pipe can also act as an inlet to pond.

Drawdown present Yes X, No _____. Operative Yes X, No _____.

Comments: See Nos. 2 and 3 above.

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 24½' at inspection.

Material: Turf _____. Brush & Trees _____. Rock fill X. Masonry _____. Wood _____

Other Stone paving.

Condition: 1. Good X. 3. Major Repairs _____

2. Minor Repairs _____. 4. Urgent Repairs _____

Comments: Stone paved slope appears of good alignment and grade and stable on main dam—stone masonry side walls of overflow intake channel failing—see remarks, also item #9 comments.

8. DAM DOWNSTREAM FACE: Slope 2:1.

Material: Turf X. Brush & Trees _____. Rock Fill _____. Masonry _____. Wood _____

Other _____

Condition: 1. Good _____. 3. Major Repairs _____

2. Minor Repairs X. 4. Urgent Repairs _____

Comments: Area 25' to 30' long and 10' ± wide at toe of downstream slope shows strong seepage. Area located where large spruce trees grow at toe of slope.

9. EMERGENCY SPILLWAY: Available Yes. Needed _____.

Height Above Normal Water: 0 Ft.

Width 24 Ft. Height 5 Ft. Material Concrete walls.

Condition: 1. Good _____.

3. Major Repairs _____.

2. Minor Repairs X.

4. Urgent Repairs _____.

Comments: Stone masonry side wall on southerly side of intake channel to overflow weir is failing. Many misplaced stones from wall lay at base of wall-

top of bank has 4 or 5 6" to 8" trees growing-One large Hemlock tree has been recently cut--root systems could be cause of wall failure.

10. WATER LEVEL AT TIME OF INSPECTION: 8 1/2 Ft. Above _____ Below X.

Top Dam X F.L. Principal Spillway _____.

Other _____.

Normal Freeboard 5' to 12' Ft. Varies with amount of use of water.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment See item #9, comments, above

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam Turf cover poor on ssapace area-see item #8.

Cracked or Damaged Masonry Southerly stone masonry wall on spillway intake failing. (See item #9.)

Evidence of Seepage Yes--see item #8--also remarks.

Evidence of Piping None found

Leaks None found

Erosion None found

Trash and/or Debris Impeding Flow None found

Clogged or Flocked Spillway None found

Other _____

(12.)

OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X _____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list_____.

(13.)

REMARKS AND RECOMMENDATIONS: (Fully Explain)

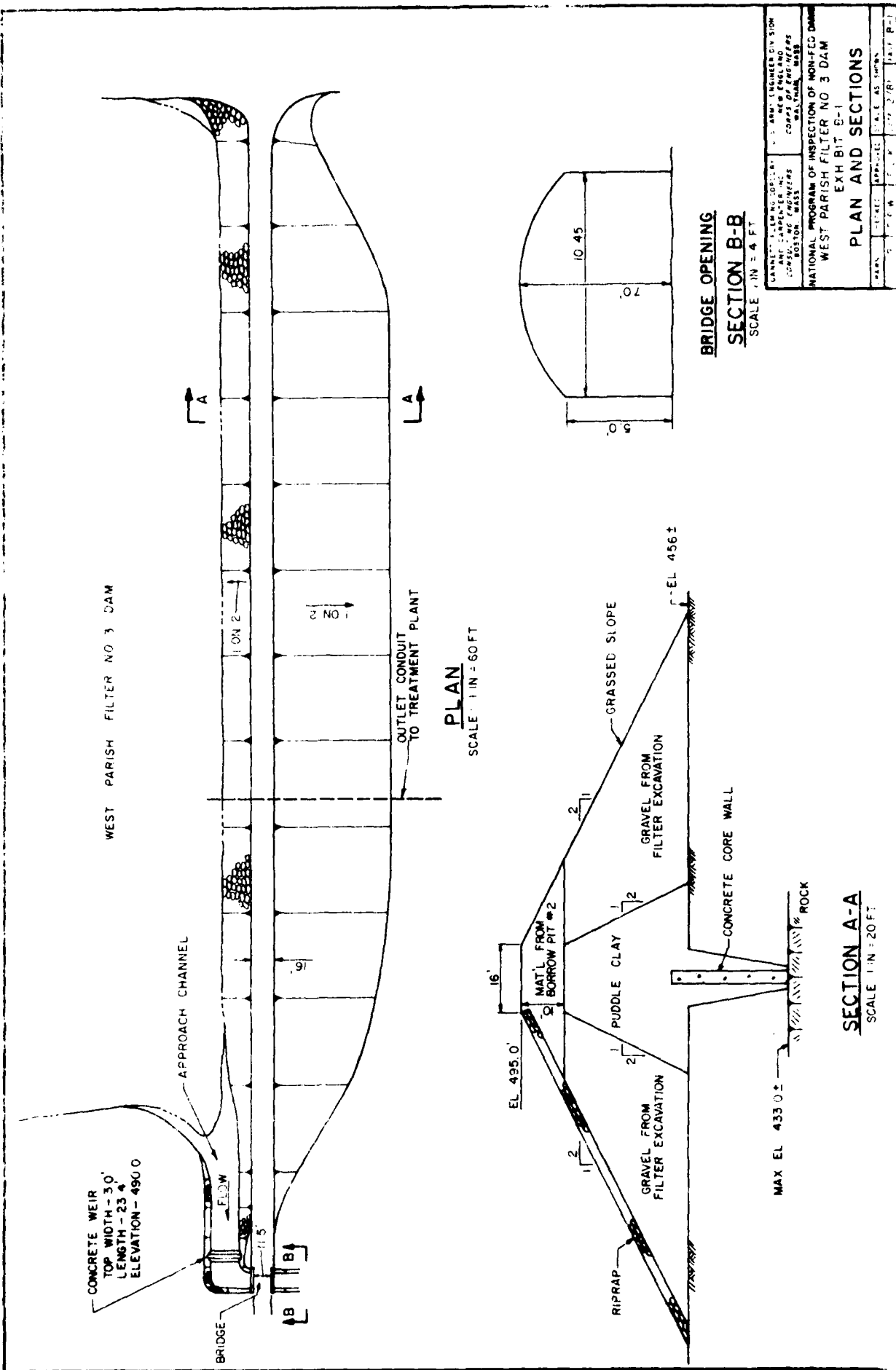
This is an old gravity earthen dam with a concrete core or cut off wall to ledge and a puddled clay core. The grade and alignment of embankment appeared good. The top carries a gravel roadway. The stone paved upstream slope appeared stable and the downstream slope was well turfed with exception of seepage area. This seepage area is at toe of downstream slope near northeasterly end of a growth of large spruce trees growing at toe of slope. These trees are 12" to 20" in diameter and do not appear to present a hazard to safety of dam as they are growing on level ground near toe of embankment. Some of the root systems however, could be extending into seepage area. This seepage area is 25' to 30' long and extends from toe of slope up the slope for 10' to 12' in width. Turf cover on this wet area is sparse to non-existent. There was no flow of water evident but some standing water was noted at toe of slope. This condition was viewed with Mr. Robert Riegel, Supt. of West Parish Filters, and Mr. Riegel stated he would keep a constant check on the area. He also stated that if area did not dry up when wet weather cleared the Springfield Water Dept. would investigate further for the cause of the present condition noted.

The failing condition of the stone masonry sidewall on the southerly side of intake channel to emergency overflow wier was also viewed with Mr. Riegel. He agreed that rest of trees growing on top of channel bank should be cut and that he would have wall repaired as soon as possible to prevent possible high water erosion of embankment. The inflow to reservoir is mostly controlled as this is a raw water settling pond before water goes to filter beds.

Resulting damages from any failure of this dam would be confined mostly to owners installations and filter beds.

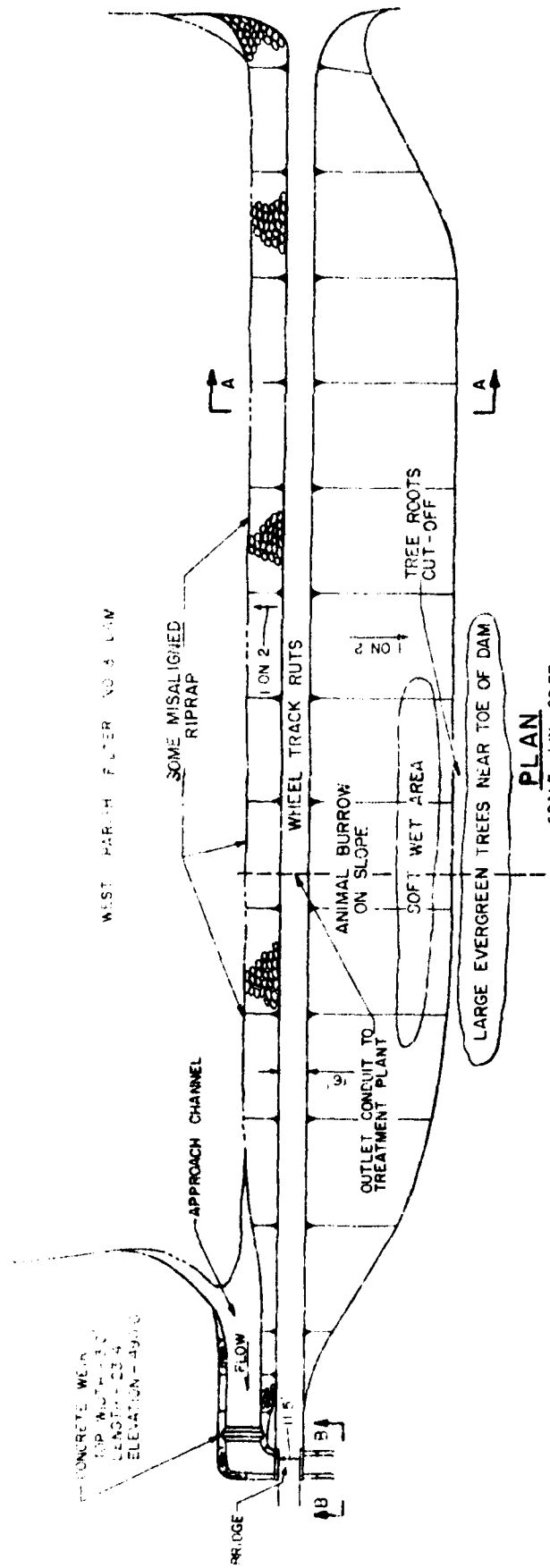
This dam appears to be basically sound and safe with routine maintenance repairs needed.

HTS/at

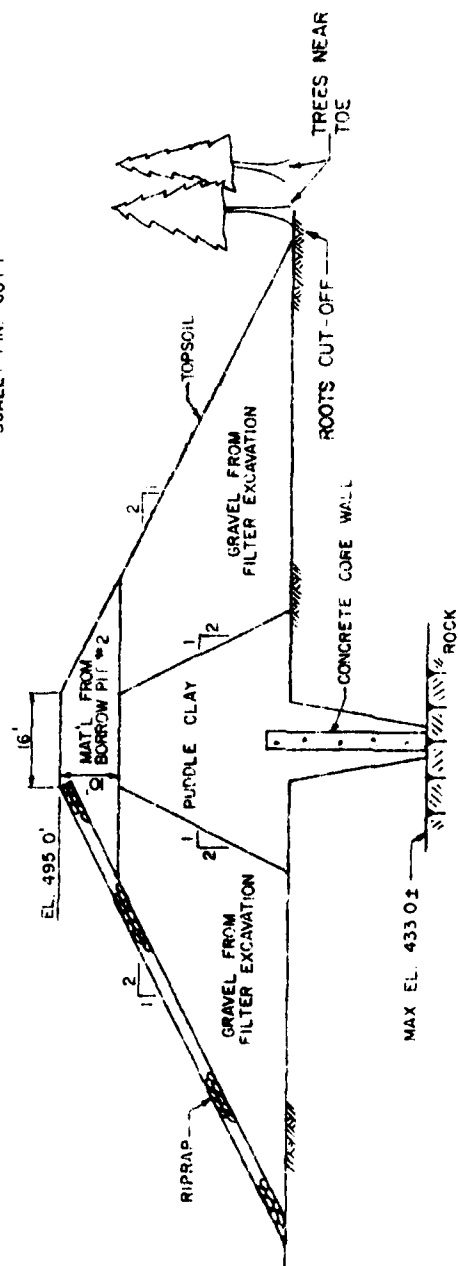


NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS WEST PARISH FILTER NO. 3 DAM EXH BIT B-1		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
PLAN AND SECTIONS		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
DRAWN BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
CHECKED BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
DESIGNED BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
CONSTRUCTION BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
CONSTRUCTION BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
CONSTRUCTION BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
CONSTRUCTION BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61
CONSTRUCTION BY: J. L. M. NO. 208-1-61		DATE	11-1-61	APP'D	11-1-61	BY	11-1-61	11-1-61

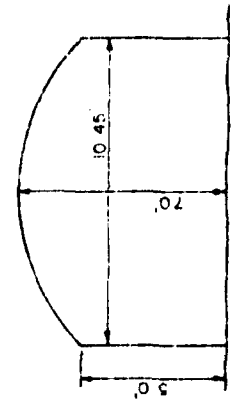
31



PLAN
SCALE: 1 IN = 50 FT



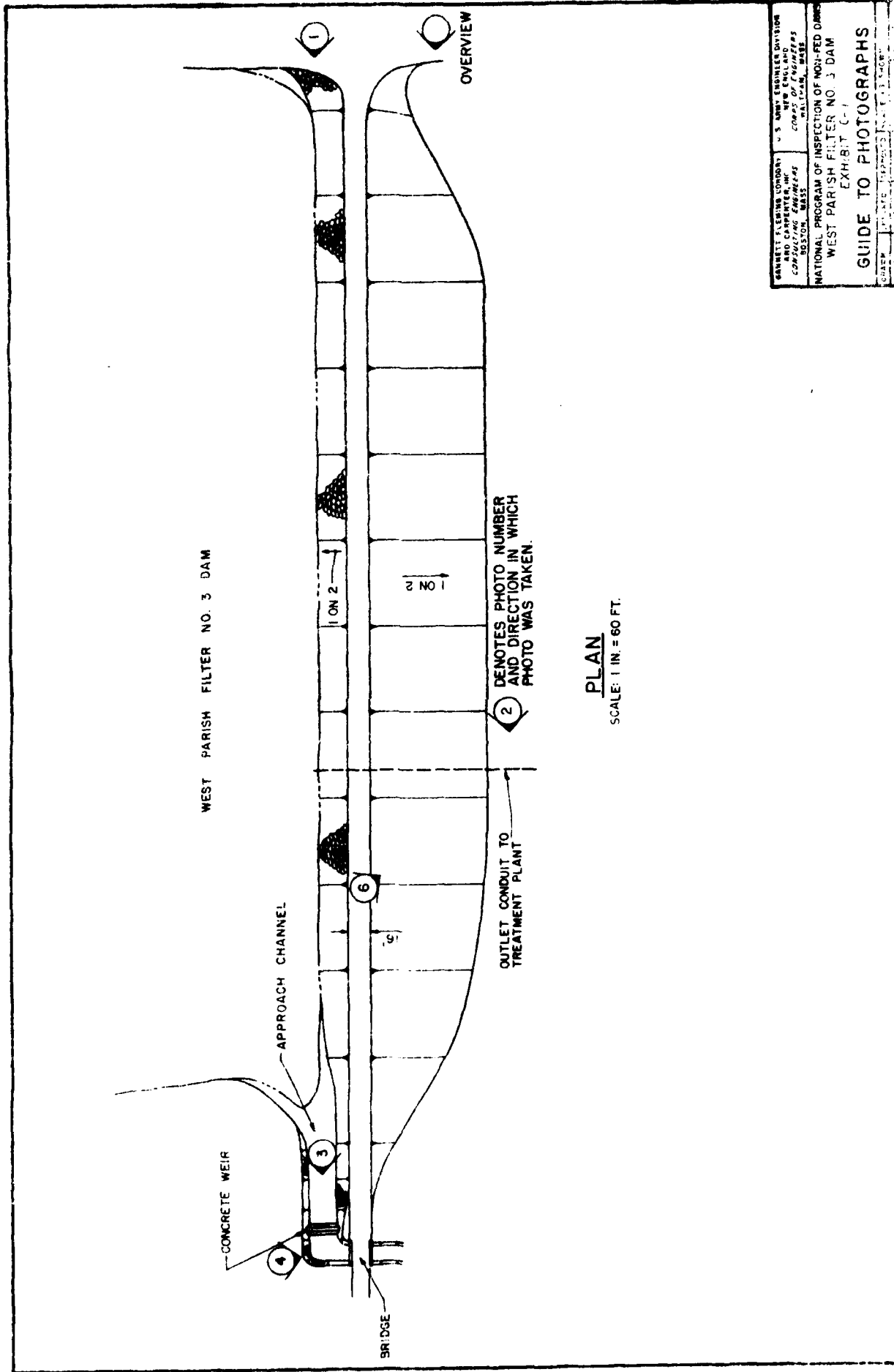
SECTION A-A
SCALE: 1 IN = 20 FT



BRIDGE OPENING
SECTION B-B
SCALE: 1 IN = 4 FT

GARNETT FLEMING CORP.		ARMY ENGINEER DISTRICT	
1000 W. 10TH ST.		NEW ORLEANS, LA 70112	
CORP. ENG. DIST. NO. 1		DIST. NO. 1	
BOSTON, MASS.		MASS.	
NATIONAL PROGRAM OF INSPECTION OF NONFEDERAL DAMS			
WEST PARISH FILTER NO. 3 DAM			
EXHIBIT 2-1			
RESULTS OF VISUAL INSPECTION			
DESIGNED	CHECKED	APPROVED	DATE
ELL	DSW	P. K.	11/2/81
			SCALE: 1 IN = 4 FT

APPENDIX C
PHOTOGRAPHS



GANNETT FLINCO COMPANY ENGINEERS, ARCHITECTS AND CONSULTANTS, INC. BOSTON, MASS.		U. S. ARMY ENGINEER DIVISION NEW ENGLAND CORPS OF ENGINEERS WALTON, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
WEST PARISH FILTER NO. 3 DAM			
EXHIBIT C-1			
GUIDE TO PHOTOGRAPHS			
DATE	BY	NO.	REV.

WEST PARISH FILTER NO. 3 DAM



Photo No. 1

View of dam crest and upstream slope from left abutment.



Photo No. 2

View of downstream slope and toe area.
Slope is soft and wet in this area. Large tree roots
in photo center have been cut off and light colored
portions which penetrate the embankment are decaying.

WEST PARISH FILTER NO. 3 DAM



Photo No. 3

View of side channel spillway. Note earth approach channel, concrete overflow section and stone lined outlet channel.



Photo No. 4

View of spillway discharge channel. Note concrete bridge.

WEST PARISH FILTER NO. 3 DAM



Photo No. 5

View of rock-filled timber crib structure which divides the reservoir into two sections.



Photo No. 6

View of water treatment plant building located near the toe of the dam.

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

BY D/W DATE 1/81
CHKD. BY am DATE 2/81

SUBJECT West Parish Filter No. 3 Dam
Hydrology and Hydraulics

SHEET NO 1 OF 5
JOB NO _____

West Parish Filter No. 3 Dam
Basic Data

Drainage Area = 0.07 mi²

Watershed Classification: Mountainous terrain

Size: Small

Hazard Classification: High

Reservoir Surface Area:

At spillway crest (normal pool): 8.8 acres

At top of dam (low point on top): 10.3 acres

At top of dam (design level): 10.9 acres

Elevations:

Streambed at toe of dam: El. 456.0

Spillway crest (normal pool): El. 490.0

Top of dam (low point): El. 493.5

Top of dam (design level): El. 495.0

Storage capacity:

At spillway crest (normal pool): 99.7 acre-ft. ✓

At top of dam (low point): 133.1 acre-ft. ✓

At top of dam (design level): 149.0 acre-ft. ✓

Lengths:

Spillway crest: 23.4 feet

Top of dam: 800 feet

Test Flood Inflow

For the size (small) and hazard classification (high hazard) of West Parish Filter No. 3 Dam, the recommended test flood ranges from the $\frac{1}{2}$ PMF to the PMF. Since the primary damage center is located just beyond the toe of the dam and since many lives could be lost, the PMF is selected as the test flood for the analysis.

There are two 42-inch diameter conduits that provide additional inflow to West Parish Filter No. 3 Dam. The conduits are fed from Cobble Mountain Reservoir, located in another watershed to the west. Valves on the conduits provide a means of regulating or shutting off the inflow. As a result, only inflow coming directly from the West Parish watershed will be considered in the analysis.

The curves for discharge per square mile vs. drainage area provide peak flows for watersheds only as small as 2 mi^2 . Since the West Parish watershed is only 0.07 mi^2 , the peak flow rate for 2 mi^2 will be used. The watershed is mountainous terrain.

$$\begin{aligned}\text{Test Flood Inflow} &= Q_{p1} = 0.07 \text{ mi}^2 \times 2,550 \text{ cfs/mi}^2 \\ Q_{p1} &= 179 \text{ cfs (PMF)}\end{aligned}$$

Spillway Rating Curve

The spillway has a side-channel configuration, but there is insufficient data to determine whether it is properly designed. For the purposes of this study, it is assumed that no choking of the weir occurs and that the weir equation ($Q = CLH^{3/2}$) applies over the entire range of flows.

$$\text{Crest length} = 23.4'$$

$$\text{Crest elevation} = 490.0$$

$$\text{Discharge coefficient} = 3.1$$

$$Q = (3.1 \times 23.4) (Pool \text{ El.} - 490.0)^{3/2}$$

BY gaw DATE 1/81
CHKD BY gaw DATE 1/81

SUBJECT West Parish Filter No. 3 Dam
Hydrology and Hydraulics

SHEET NO 3 OF 5
JOB. NO. _____

Routing Curve for Test Flood (PMF)

$$Q_{p2} = Q_{p1} (1 - \text{Stor}/19)$$

$$Q_{p1} = 179 \text{ cfs}$$

$$\text{Stor} = \text{Storage in inches}$$

$$\text{Stor} = \frac{\text{Storage (acre-ft)} \times 12}{0.07 \times 640}$$

Start routing with pool at spillway crest.

<u>Pool Elev.</u>	<u>Storage (acre-foot)</u>	<u>Stor (inches)</u>	<u>Q_{p2} (cfs)</u>
490.0	0	0	179 ✓
493.5	33.4 ✓	8.95 ✓	95 ✓
495.0	49.3 ✓	13.21 ✓	55 ✓

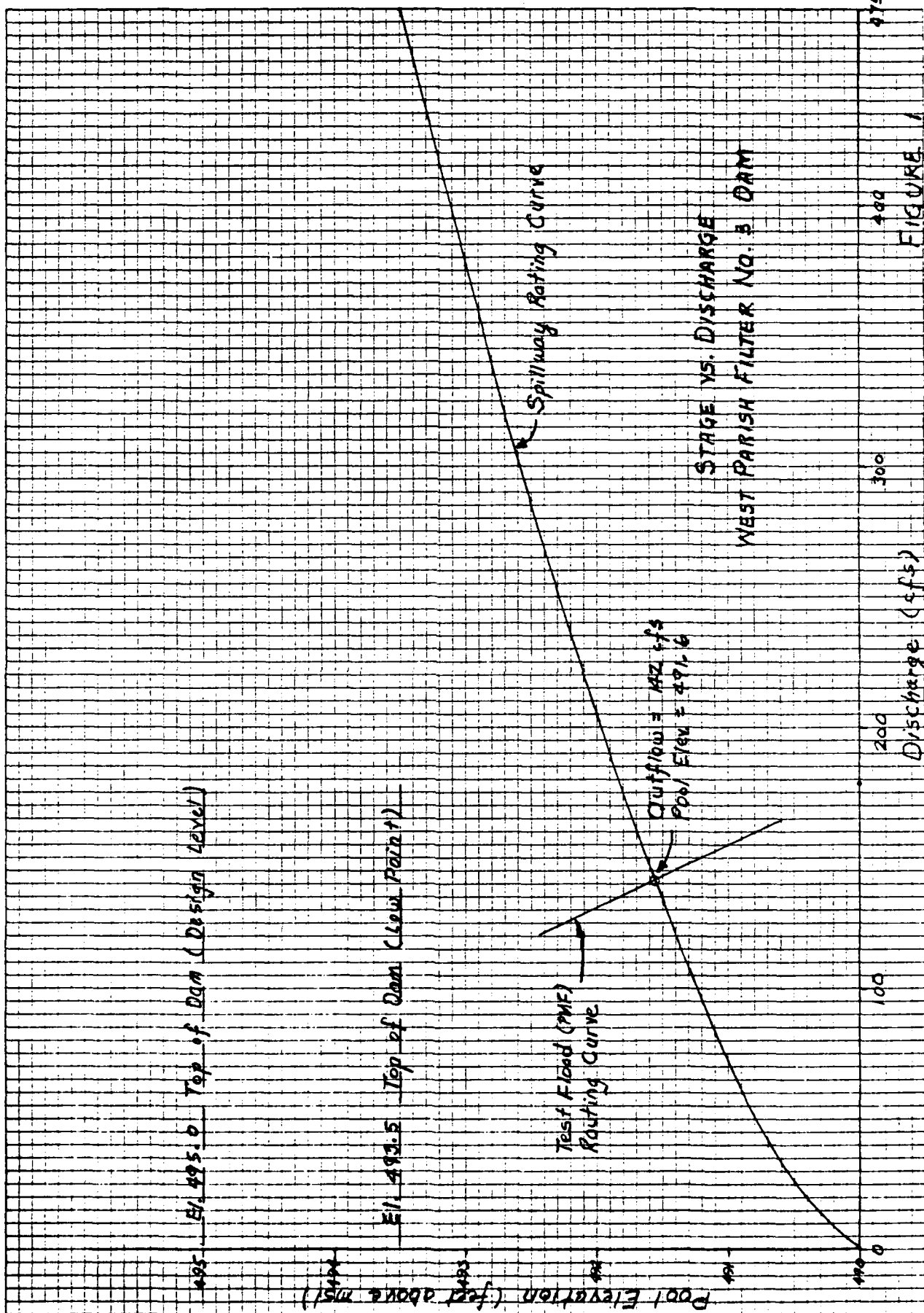
From Results Shown on Figure 1 (next sheet):

Pool Elevation resulting from test flood (PMF) = El. 491.6

Top of dam elevation (low point) = El. 493.5

Spillway discharge during test flood = 142 cfs

Remaining freeboard during test flood = 1.9 feet



BY PSW DATE 1/81
CHKD BY CMP DATE 1/81

SUBJECT West Parish Filter No. 3 Dam
Hydrology and Hydraulics

SHEET NO 4 OF 5
JOB NO _____

Dam Failure Analysis

Since the test flood (PMF) level is lower than the top of the dam, dam failure will be analyzed with the pool at the test flood level (El. 491.6). Storage at time of failure = 114 acre-feet. Outflow just prior to failure = 142 cfs.

There is a timber crib structure in the reservoir that divides the reservoir into two sections. The purpose of the structure is to promote particle settlement in an area away from the water supply intake. An orifice with a timber flap gate allows equalization of pool levels in the two sections. Since the structure is tall and thin, it could only momentarily withstand significant pool level differentials such as would occur during dam failure. As a result, it is judged that the structure would not have significant effects during dam failure.

Breach Outflow

$$Q_B = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

$$Y_o = 35.6'$$

$W_b \leq 40\%$ of dam length
at mid-height

$$Q_B = \left(\frac{8}{27}\right)(200)(32.2)^{1/2}(35.6)^{3/2}$$

$$W_b \leq (0.4)(640) \leq 256'$$

$$Q_B = 71,426 \text{ cfs}$$

$$\text{Use } W_b = 200'$$

Check time to drain reservoir:

$$T = \frac{2S}{Q_B}$$

T = time in seconds

S = Storage in ft^3

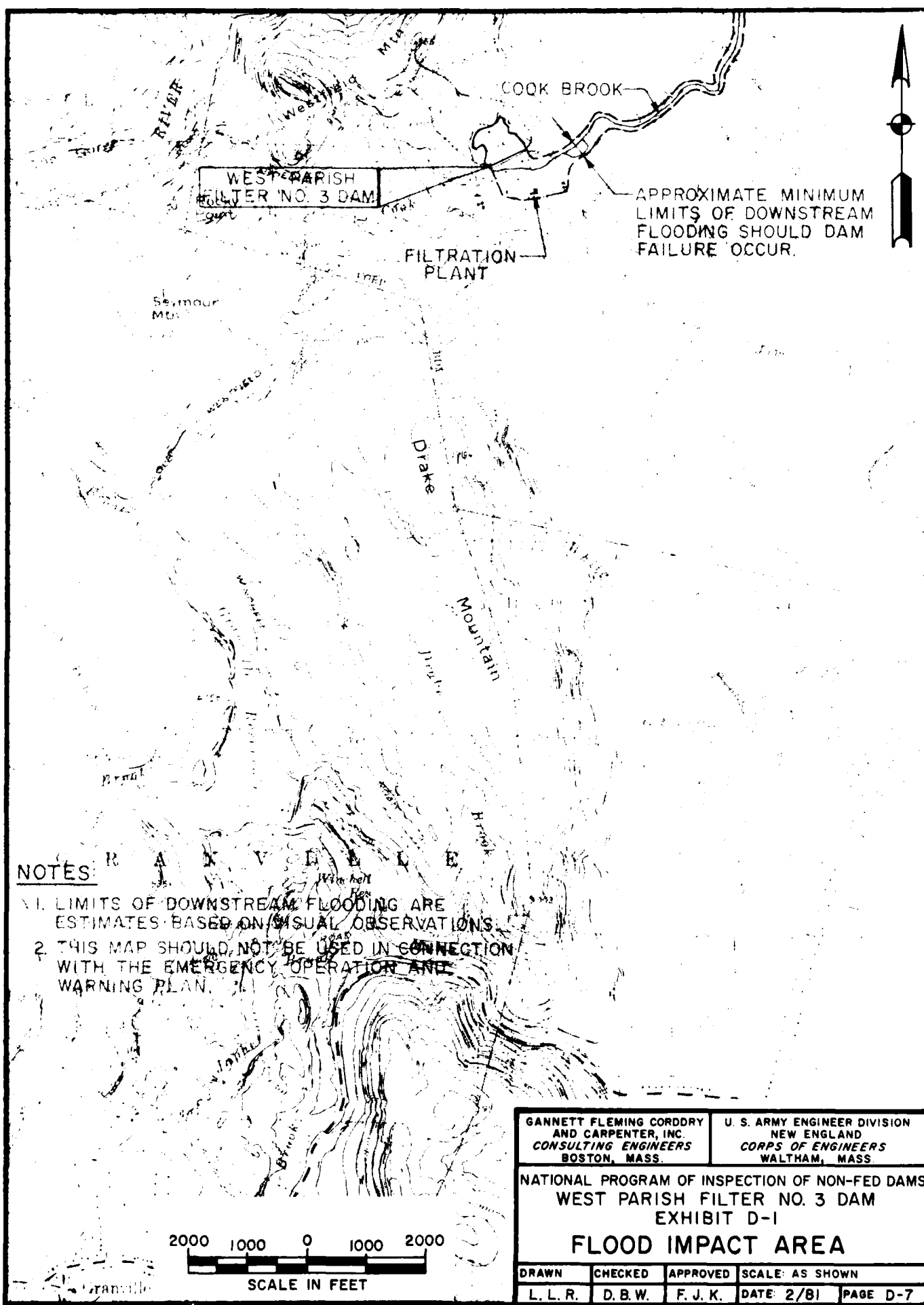
Q_p = Outflow in cfs

$$T = \frac{(2)(114 \text{ acre-ft})(43,560 \text{ ft}^2/\text{acre})}{71,426 \text{ ft}^3/\text{sec}} = 139 \text{ sec} = 2.3 \text{ min.}$$

Time to drain is judged to be too short.

Revise W_b to 100' and recompute Q_B .

$$Q_B = 71,426/2 = 35,713 \text{ cfs} \quad T = (2.3)(2) = 4.6 \text{ min.}$$



- NOTES:
1. LIMITS OF DOWNSTREAM FLOODING ARE ESTIMATES BASED ON VISUAL OBSERVATIONS.
 2. THIS MAP SHOULD NOT BE USED IN CONNECTION WITH THE EMERGENCY OPERATION AND WARNING PLAN.



GANNETT FLEMING CORDRY AND CARPENTER, INC. CONSULTING ENGINEERS BOSTON, MASS.		U. S. ARMY ENGINEER DIVISION NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS WEST PARISH FILTER NO. 3 DAM EXHIBIT D-1 FLOOD IMPACT AREA			
DRAWN	CHECKED	APPROVED	SCALE: AS SHOWN
L. L. R.	D. B. W.	F. J. K.	DATE: 2/81 PAGE D-7

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS



INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	COUNTY	STATE	COUNTY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
CT	1	1	1	1	BLOOMFIELD DAM	41 51.3	72 44.6	13 FEB 81

POPULAR NAME	NAME OF IMPOUNDMENT
TOWN'S RESERVOIR	BLOOMFIELD RESERVOIR

REGION	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
1	WASH BROOK	BLOOMFIELD	0	18600

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRAINING HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES (ACRE-FT.)	DIST OWN	FED R	PRV/FED	SCB A	VEN/DATE
1	1962	C	32	29	3200	NED	N	N	8	

REMARKS

D/S HAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU YD)	POWER CAPACITY (KW)	PROPOSED NO.	NAVIGATION LOCKS
1	1	2173	140500	1	1	1

OWNER	ENGINEERING BY	CONSTRUCTION BY
State of CT	USDA-SCS	KOLLA CONSTRUCTION

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
1	1	1	TOWN OF BLOOMFIELD

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
1	1 DEC 80	PL 92-367

REMARKS

END

FILMED

8-85

DTIC